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SPOTLIGHT ARTICLE

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Thompson, Biographer

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SPOTLIGHT SECTION
Silvanus P. Thompson: Quaker polymath and public scientist-engineer

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Abstract

This paper addresses the role of religion in the construction of scientific biographies. As a devout Quaker, Silvanus Phillips Thompson believed that biographical writing was a serious endeavour and considered that it had a moral purpose. His short biographies of Philipp Reis and William Sturgeon sought to do justice to the achievements of these two little-known inventors. Likewise, in his longer biographies of Michael Faraday and Lord Kelvin (William Thomson), he emphasised his subjects' strong moral qualities and dedication to seeking after truth. They were portrayed as committed Christians—honest, empathetic, and altruistic. In opposing the positivist view of science, Thompson stressed the role of intuition—the "Inner Light"—in the scientific discoveries made by Faraday and Kelvin.

KEYWORDS
Lord Kelvin (William Thomson), Michael Faraday, Quakerism, Scientific biography, Silvanus Thompson

Historians of science who have conducted case studies of scientific biography often focus on the relationship between biographer and biographical subject. They have also analysed the structure of such narratives and discussed their historical meanings, social functions, and gender connotations.[1] However, little attention has been paid to the role of religion in the construction of biographies of scientists. This paper therefore examines the biographical writings of a devout Quaker, Silvanus Phillips Thompson, and especially his biographies of Michael Faraday and of William Thomson (referred to below as Kelvin in order to avoid confusion).[2] It is argued that in writing these texts and in his other excursions into scientific biography, Thompson drew heavily on Quaker themes and particularly stressed

[1]See especially the papers published in Shortland & Yeo (1996) and Govoni & Franceschi (2014).
[2]S. P. Thompson (1898; 1910).

his subjects' moral attributes. Thus, this paper links Thompson's portrayals of Faraday and Kelvin—especially the former—to the moral qualities fostered by the *Book of Christian Discipline* (1883), which specified how Quakers should conduct themselves, and to Thompson's own contributions to Quaker literature.[3]

In *Quakers, Jews, and Science*, I argued that 19th-century Quakers generally adopted a very positive attitude towards science, including Darwin's theory of evolution. Like many other Quakers, Thompson recognised that both science and religion are profoundly important human activities. Yet in both areas, serious pitfalls exist that must be avoided. For example, Quakers consider that dogma has perverted religion and therefore seek to eliminate it from their own religious practices. Likewise, Thompson argued that prejudices, such as the uncritical acceptance of a scientific theory, are inimical to the spirit of science.[4] Moreover, he insisted that science should be pursued ethically and in ways that accorded with Quaker tradition. The present paper extends our understanding of Thompson, beyond his activities as a practitioner and teacher of science, to include his biographical writings, which reflected his relationships with the (mostly deceased) subjects of his biographies. Quaker advice demonstrating how a Friend should relate to others is therefore germane to our discussion. At the heart of this issue lies the doctrine of the "Inner Light"—the appreciation of the divine spark in oneself and in others.[5]

This belief in the "Inner Light" underpinned such Quakerly advice as "Be kind and tender-hearted one to another"; "Maintain that charity which suffereth long, and is kind"; and "Let each be tender to the reputation of his brother."[6] As a committed Friend, Thompson sought to enact such precepts in his daily interactions with others, and, as I argue, they also featured prominently in his portrayal of biographical subjects.

Thompson's biographies were informed by the specifically Quaker tradition of biographical writing. Following the death of a righteous Friend, the local Quarterly Meeting generally prepared a form of obituary known as a testimony. Unlike conventional obituary notices, however, the purpose of testimonies "is not eulogy, but to preserve a record of the power of divine grace in the lives of the Lord's faithful servants."[7] Thus the deceased Friend's spiritual journey was emphasised, with attention paid to any impediments the subject surmounted and her commitment to Quakerly ideals. This morally uplifting form of literature was intended to impress the reader with the subject's manifest virtues and to provide an ethical role model. Obituary notices were also frequently published in Quaker periodicals, including the *Friend* (f. 1843) and the *British Friend* (1843–1913), and especially in the *Annual Monitor*, which recorded Quaker deaths between 1812 and 1919. Utterly familiar with this form of biographical writing, Thompson likewise sought to combine biographical facts of his subjects' lives with accounts of their moral engagement with others and with their science.

Thompson's biographical writings should be appreciated in the wider context of contemporary scientific biographies, a high proportion of which were penned by fellow scientists. These were often written to demonstrate their subjects' creative genius and the impact of their research on the development of science. For example, John Tyndall wrote a biography of his mentor, Michael Faraday, while the botanist Francis Darwin edited a three-volume life and letters of his eminent father, Charles.[8] Thompson clearly considered that biography was an important genre for communicating scientific innovations, the nature of science, and, more specifically, the moral lives of his biographical subjects to a wider readership. Of his 15 commercial publications, three were scientific biographies, two were contributions to the Quaker literature, and the rest were on scientific and technological topics. Moreover, most of his privately printed works were texts, translations, and biographical writings concerning the 16th-century "magnetizer" William Gilbert.[9] While a number of contemporary British scientists wrote scientific biographies, they rarely

[3]S. P. Thompson (1896; 1915; 1918).
[4]Cantor (2005, esp. pp. 268–269); S. P. Thompson (1896).
[5]The *Book of Christian Discipline* (1883, p. 7) attributes to Jesus (John 1:9) "that true light which enlightens every man coming into the world; and therefore that men are to believe in the light, that they may become the children of the light." Thompson used the phrase "Inner Light" in S. P. Thompson (1915, pp. 9, 108, 109) and S. P. Thompson (1918, p. 25); and the phrase "light within" in S. P. Thompson (1918, p. 123). More often he used the word light or spirit.
[6]*Book of Christian Discipline* (1883, pp. 67, 70).
[7]*Book of Christian Discipline* (1883, p. 213). Such testimonies were sometimes published in the series *Testimonies of Deceased Ministers*, which was issued annually by the London Yearly Meeting between 1837 and 1860.
[8]Tyndall (1868); Darwin (1887).
[9]J. S. Thompson & H. G. Thompson (1920, pp. 357–358).

produced more than a single biographical study. By contrast, Thompson was exceptional in writing four biographies (or five, if his piece on William Sturgeon is included), two of which were very substantial. These publications indicate the extent of his immersion in and commitment to this genre.

1 | THOMPSON'S EARLIER BIOGRAPHICAL WRITINGS

Before examining Thompson's biographies of Faraday and Kelvin, three other excursions into scientific biography must be mentioned briefly. The first arose from his interest in the scientific contributions of William Gilbert. Thompson's *Gilbert, of Colchester: An Elizabethan Magnetizer* (1891) was initially read as a paper before a bibliographical group, the Sette of Odd Volumes, in which he was active. Thompson's text contains a wealth of factual information, drawn from a wide range of sources, about Gilbert's life and work. Thompson also set Gilbert in his historical context, arguing that he "stands forth preeminent as the founder of the science of electricity."[10] In particular, Gilbert is portrayed as having "rescued the study of the magnet from the atmosphere of occult mysticism with which it was surrounded, and placed it for ever on a scientific basis."[11] He emerges as a man of intellectual strength and integrity who rejected the prevalent authority of Aristotle—Gilbert's aphorism "Philosophia nova contra Aristotelem" is quoted approvingly by Thompson—along with the many fables about magnets and magnetic action.[12] Thompson portrayed Gilbert as a fellow seeker after truth and the first authentic empiricist, who based his study of magnetism on careful observation and experimentation. Thompson subsequently published a translation, running to some 250 pages, of Gilbert's *De magnete*, and in 1903 he issued a heavily annotated edition of the chapter from *De magnete* entitled "On the Attraction of Amber, or More Truly, on the *Attaching of Bodies to Amber*."[13]

In 1883, Thompson published a volume on Johann Philipp Reis (1834–1874), the German inventor of an early form of telephone. As Stathis Arapostathis and Graeme Gooday argue, *Philipp Reis: Inventor of the Telephone* contains a number of testimonials and technical documents that Thompson collected in the expectation of a court case to establish Reis's priority in the invention of the telephone over the claims of Alexander Graham Bell, Thomas Alva Edison, and others.[14] In writing this book, Thompson conscientiously undertook much research, including a trip to Germany to find relevant documents and to talk with Reis's "friends, acquaintances, and pupils" and surviving family members.[15] The book's opening chapter forms a brief biography of Reis's short life that goes well beyond his work on the telephone. Thompson provides the reader with an appreciation of Reis's personality and upbringing; for example, he quoted from an autobiographical document in which Reis described how, when young, his father strove "constantly to cultivate my mental powers by instruction concerning the things which surrounded me" and how his grandmother shaped his character and deep religious convictions. Thompson also described how Reis's slow death from "[p]ulmonary consumption" affected his research and prevented him from presenting his innovative work on the telephone to the scientific community.[16]

Denying any personal advantage from publishing this book, Thompson stated that he was motivated solely by the wish to be "of service in rendering justice to the memory of the departed worthy [Reis]."[17] In accordance with the Quaker exhortation to encompass "the Spirit of Truth," he vigorously supported the priority claim of this relatively unknown schoolmaster, whom he had never met, against the claims of the wealthy, eminent, well-established telephone engineers.[18] Likewise, he supported his friend Oliver Lodge's priority over the invention of the wireless

[10]S. P. Thompson (1891a, p. 10).
[11]S. P. Thompson (1891a, p. 9).
[12]S. P. Thompson (1891a, p. 24).
[13]S. P. Thompson (1891a); Gilbert (1900; 1903).
[14]Arapostathis & Gooday (2013, p. 98).
[15]S. P. Thompson (1883, p. vi).
[16]S. P. Thompson (1883, pp. 1–10).
[17]S. P. Thompson (1883, p. v).
[18]*Book of Christian Discipline* (1883, *passim*).

against what he considered to be the inflated claims of Guglielmo Marconi, which resulted in a court case in 1911 that was resolved in Lodge's favour.[19]

Thompson imported biographical material into some of his scientific and technical texts. In particular, he included in his technical manual, *The Electromagnet and Electromagnetic Mechanisms* (1891), a short appendix on the innovative electrical research and inventions of William Sturgeon, who had died in 1850. This memoir is a further example of his deployment of biography to correct an injustice, in this case the widespread neglect of Sturgeon's achievements. Thompson and James Joule (who was cited in this appendix) provided evidence that Sturgeon was among the first to make several significant technical innovations, including constructing an electromagnet and an electric motor, yet, they argued, those with much higher public profiles had generally been accorded priority. Sturgeon was an outsider who had not been elected a Fellow of the Royal Society and had suffered poverty late in life.[20]

In accordance with Quaker exhortations to embrace truth, justice, and charity in Friends' dealings with others, Thompson advanced the widely ignored claims of Reis and Sturgeon, arguing that their scientific and technical innovations should be publicly recognised.[21] Towards the end of his life, Thompson's empathy and generosity of spirit were also apparent in a short appreciation he wrote of the chemist and entomologist Raphael Meldola, with whom he had worked closely for some 30 years at Finsbury Technical College: "Better friend no man could desire. Better and truer colleague no man could ever have. … a true friend we have lost. Few men have been more beloved than he."[22]

2 | BIOGRAPHIES OF FARADAY AND KELVIN

Although Thompson never met Faraday (who had died in 1867, when Thompson was 16), he, like many contemporaries, viewed Faraday as his scientific hero.[23] He was thoroughly familiar with Faraday's researches and introduced some of Faraday's ideas and discoveries to his students at University College, Bristol, and later at Finsbury Technical College. In 1894, Thompson received an invitation from the chemist Henry Roscoe to contribute a volume on Faraday to the *Century Science Series* of scientific biographies that Roscoe was editing for the publisher Cassell and Company. Thompson was offered £80 for a text that would fill some 220 duodecimo pages. "It is a tempting subject, and I'm sure that you would do it justice," invited Roscoe.[24] Thompson responded positively to this request, although it took him some 4 years to complete the task. However, during that time he delivered a lecture on Faraday's life and work at the Quaker Meeting House in York; this was a public lecture attended by both Quakers and others. The brief report published in a local newspaper does not illuminate any specifically Quaker issues.[25]

Thompson took the commission very seriously, consulted numerous documents, corresponded with a number of people who had known Faraday, collected many anecdotes, examined letters to and from Faraday, and paid close attention to his experimental notebooks on deposit in the Royal Institution. In early January 1898, Thompson approached the Managers to request permission to quote extracts from Faraday's notebooks that "have not been published before." Although he informed the Managers that his book was "to be published immediately," *Michael Faraday: His Life and Work* did not appear in print until November 1898.[26] It was initially published at 5*s*. and was soon followed by a popular edition at 2*s*. *6d*.[27] In his preface, Thompson justified the publication of his biography in

[19]S. P. Thompson (1911); Arapostathis & Gooday (2013, pp. 170–172).
[20]S. P. Thompson (1891b, pp. 412–418). See also Morus (1992).
[21]*Book of Christian Discipline* (1883, esp. pp. 67–89).
[22]Marchant (1916, pp. 30–32).
[23]Cantor (1996).
[24]J. S. Thompson & H. G. Thompson (1920, p. 166). When published, Thompson's text filled some 300 pages.
[25]"The Life and Work of Faraday" (1895, April 13).
[26]Greenaway et al. (1971, Vol. 15, p. 282). Entry for January 6, 1898. An undated letter to Crookes (J. S. Thompson & H. G. Thompson [1920, p. 166]) conveys the impression that Thompson gave some lectures on Faraday's work at the Royal Institution prior to being approached by Roscoe. However, this letter must postdate 1900, when Crookes became secretary of the Royal Institution.
[27]S. P. Thompson (1898).

terms of Faraday's achievements: He was "the greatest scientific expositor of his time" and the man who extended "the boundaries of knowledge" and laid "the foundations … of electrical engineering [and of] the theories of electricity, magnetism, and light." Moreover, Thompson wanted to preserve "gracious memories" of Faraday and of his "rare and unselfish kindliness."[28]

In March 1906, Thompson wrote to the 81-year-old Kelvin to enquire whether he would permit him to write Kelvin's biography. Thompson had previously sent him a copy of the Faraday biography, to which Kelvin replied: "It gives, I believe, a thoroughly truthful view of his [Faraday's] scientific work and of his life." Kelvin then expressed his "complete confidence" in Thompson to undertake the task of writing his own biography.[29] They met on a number of occasions to discuss the project, but these meetings terminated with Kelvin's death on December 17, 1907. Four and a half months later, Thompson delivered the "Kelvin Lecture" on his "Life and Work" to the Institution of Electrical Engineers.[30] This lecture was, in a sense, the first draft of what became his 1300-page, 2-volume *The Life of William Thomson, Baron Kelvin of Largs*, which was published by Macmillan in late January 1910 at 30*s*.[31]

Although Thompson had initially intended to write a single-volume work, soon after Kelvin's death his family persuaded Thompson to expand the projected work, which they viewed as Kelvin's authorised biography. Given its much greater length and the more formal role it was intended to play, a significant proportion of text was devoted to transcriptions of letters and other documents. *The Life of William Thomson* is thus closer than his Faraday biography in both form and content to the "life and letters" volumes that celebrated the lives of several other Victorian scientists, including Faraday, Adam Sedgwick, and Charles Darwin.[32] Moreover, Thompson's *Faraday* exudes a sense of ebullience that suggests that it was written principally as a labour of love, whereas his biography of Kelvin, on account of its greater length and more formal status, appears to have been written partly out of a sense of duty.

Although the Kelvin biography was much weightier than the Faraday volume, both works involved a great deal of historical research and Thompson collected reminiscences of both subjects from their surviving family and friends, especially from James Dickson, who had been Kelvin's assistant in Glasgow 1867–1869 and later became senior tutor at Peterhouse College, Cambridge.[33] In both cases, Thompson, an experienced bibliophile, was careful with sources, often citing bibliographical information about the letters and other documents from which he quoted.

3 | FARADAY AND KELVIN AS PRACTITIONERS OF SCIENCE

It is not surprising that Thompson chose to write the biographies of two men who had made significant contributions to the subject of electricity, which he himself had both taught and researched. Although Faraday did not consider himself an electrical engineer, his work led to many practical applications, while Kelvin, like Thompson, contributed not only to the science of electricity but was also keenly concerned with applying such research findings to engineering problems. Moreover, Kelvin worked closely with a number of electrical engineers, and on three occasions (1874, 1889, and 1907) served as president of the Society of Telegraph Engineers or its successor, the Institution of Electrical Engineers (a position Thompson held in 1899).

A significant feature of Thompson's biographies was his strong appreciation of how a subject's understanding of the world and of themselves develops in response to their experience. Take, for example, the final paragraph of the first chapter of *Faraday*: Thompson had just recounted Faraday's return to the Royal Institution following his continental tour with Humphry Davy in 1813–1815, and quoted extracts from Faraday's letters and journal. Thompson added:

[28]S. P. Thompson (1898, p. viii).
[29]J. S. Thompson & H. G. Thompson (1920, p. 283).
[30]S. P. Thompson (1908).
[31]S. P. Thompson (1910).
[32]Jones (1870); Clark & Hughes (1890); Darwin (1887).
[33]Letters 356–377, Silvanus Phillips Thompson Archive (GB 98 B/THOMPSON), Archives Department, Imperial College, London, England.

> He returned to the scene of his former labours; but with what widened ideas! He had had eighteen months of daily intercourse with the most brilliant chemist of the age [Davy] … had seen and conversed with [the leading continental scientists and] … formed a lasting friendship [with some of them] …. He had gained a certain mastery over foreign tongues, and had seen the ways of foreign society.[34]

By contrast, neither of Faraday's principal biographers—John Tyndall and Henry Bence Jones (who cited many of the relevant letters and journal entries)—appreciated how the young Faraday had been affected by his continental tour.[35] Another early biographer, John Hall Gladstone, only noted that it enabled him to become known to a number of foreign scientists.[36] By contrast, from Thompson's biography we gain a sense of the importance of this formative experience in Faraday's personal and scientific maturation.

Tracing Faraday's research through his notebooks and letters enabled Thompson to construct a narrative of Faraday's development as a scientist over a period of nearly half a century. As well as expounding the detailed progress of Faraday's experiments and theories, Thompson stressed the care Faraday lavished on his experiments in the interest of enhancing their accuracy and meaningfulness. His lively account enables the reader to appreciate Faraday at work in his laboratory. By contrast to the earlier biographies, Thompson's included not just the successful experiments but also some that failed, thus providing a more truthful account of the scientist at work. For example, he quoted the final paragraph of the 24th series of *Experimental Researches in Electricity*, in which Faraday had conducted experiments to detect the predicted relation between gravity and electricity: "Here end my trials for the present. The results are negative."[37] Yet Thompson, who portrayed Faraday as a fellow seeker after truth, saw unsuccessful experiments as a necessary part of science and therefore a significant step in the ongoing search for truth.

In *The Quest for Truth*—Thompson's Swarthmore Lecture delivered at the 1915 Yearly Meeting—he portrayed both Quakers and "scientific men" as committed to the common aim of seeking truth. Just as Quakers search for truth in all areas of their lives, especially in the realms of religion and morality, those who practise science seek truth about the natural world. Unlike other types of truth, scientific discoveries "possess the precious property that they are capable of independent verification by experiment" and thus "it is possible to arrive at something like real certainty."[38] At several points in his biography of Faraday, Thompson referred to him as a dedicated seeker after truth who was not compromised by the seductions of money or honours.[39] Similarly in his Kelvin biography, he referred to Kelvin's use of mathematics "as a tool to his hand in the discovery of truth."[40] Thus Faraday and Kelvin were cast as exemplars of Thompson's moral ideal.

In this lecture he also alerted his audience to the factors that can inhibit and compromise the search for truth. Among these he listed an excessive respect for authority, false humility (preventing the exercise of independent judgment), and "an aversion from doubt."[41] He also cited a sentence from *Experimental Researches in Electricity* in which Faraday had warned: "It is better to be aware, or even to suspect, we are wrong, than to be unconsciously or easily led to accept an error as right."[42] Many of the Quakerly qualities evoked by Thompson in this lecture were ones that he had noted in his biographies of Faraday and Kelvin, especially the former.

Like Thompson, both of his subjects were keenly involved in scientific education; Faraday gave widely acclaimed lectures at the Royal Institution, including his lectures for children, and he helped shape the science curriculum at the University of London; Kelvin was a committed teacher, having delivered lectures and superintended students'

[34]S. P. Thompson (1898, p. 34).
[35]Tyndall (1868); Jones (1870).
[36]Gladstone (1870).
[37]S. P. Thompson (1898, p. 204); Faraday (1839–1855, Vol. 3, p. 168).
[38]S. P. Thompson (1896, pp. 41–54, esp. pp. 42–43). The purpose of the annual Swarthmore Lecture is to propagate "the Message and Work of the Society of Friends." Thompson's was delivered on May 18, 1915, during the First World War.
[39]S. P. Thompson (1898, pp. 43, 240, 247–248, 271).
[40]S. P. Thompson (1910, p. 1136).
[41]S. P. Thompson (1915, pp. 34–36).
[42]S. P. Thompson (1915, p. 51); quoting Faraday (1839–1855, Vol. 3, p. 565).

laboratory work at Glasgow University throughout his long tenure as the Chair of Natural Philosophy. He had also lectured at the Royal Institution and elsewhere, and initiated major improvements to the Mathematical Tripos at Cambridge. Thompson rejected the view that science teaching was just the transfer of knowledge from lecturer to audience. For him it was also a form of moral education. In his 1877 lecture on scientific method at University College, Bristol, he had addressed the issue of "mental and moral training." Towards the end of the lecture he stated that an education in science is "absolutely priceless" and "second to none," since it not only trains the intellect but also enhances the ability to make moral judgments.[43] Thompson recognised that in their science teaching both Faraday and Kelvin were disseminating not just facts and theories but also higher values. Thus he quoted one auditor of Faraday's, Cornelia Crosse, who claimed that "No attentive listener ever came away from one of Faraday's lectures without having the limits of his spiritual vision enlarged."[44] Likewise, Thompson reported that Kelvin considered that "one of the main uses of a University was to form character."[45]

4 | THE ROLE OF INTUITION

Like many scientific biographers, Thompson used his biographical narratives to reflect on the philosophy of science and provide advice about how he considered science should—and should not—be conducted. For example, while Jones depicted Faraday as a sure-footed experimentalist, Thompson portrayed him not only as an exquisite experimenter but also as a bold and insightful framer of hypotheses. He appreciated the importance of imaginative exploration and praised Faraday for conceptualising similarly. In particular, he commended Faraday's 1846 paper "Thoughts on Ray-Vibrations" as an "avowedly speculative paper [in which] Faraday touched the highest point in his scientific writings, and threw out … brilliant hints of that which his imagination had perceived, *as in a vision*;– the doctrine now known as the electromagnetic theory of light."[46] Again, after relating Faraday's unsuccessful attempt to determine the effect of a magnetic field on a beam of light—later detected by Pieter Zeeman—Thompson wrote:

> That Faraday should have *conceived* the existence of this obscure relation between magnetism and light is a striking illustration of *the acuteness of mental vision* which he brought to bear. Living and working amongst the appliances of his laboratory, letting his thoughts play freely around the phenomena, incessantly framing hypotheses to account for the facts, and as incessantly testing his hypotheses by the touchstone of experiment, never hesitating to push to their logical conclusion the ideas suggested by experiment, however widely they might seem to lead from the accepted modes of thought, he worked on with *a scientific prevision little short of miraculous*.[47]

Faraday—the exemplary scientist—laboured long hours in the laboratory pursuing careful work, but he also possessed a remarkable power of insight, a "power of 'lateral vision.'"[48] Faraday is thus portrayed as a visionary whose insights were later developed by Kelvin, Maxwell, and others. Likewise, in his lectures at the Royal Institution, Faraday often "gave rein to his imagination" towards the close of a lecture. He thus enabled his audience to appreciate "the wider bearings of scientific principles and their relations to philosophy, to life, or to ethics" or "he outlined some wide-sweeping speculation or suggestion for future discoveries."[49] Thompson also attributed a similar role of insight to Kelvin when he wrote:

[43]S. P. Thompson (1877, pp. 28–29).
[44]S. P. Thompson (1898, p. 233); Cross (1891, p. 42).
[45]S. P. Thompson (1910, p. 1131).
[46]S. P. Thompson (1898, p. 193); emphasis added.
[47]S. P. Thompson (1898, p. 221); second and third emphases added.
[48]S. P. Thompson (1898, p. 242).
[49]S. P. Thompson (1898, pp. 232–233).

> Like Faraday, and the other great masters in science, he [Kelvin] was accustomed to let his thoughts become so filled with the facts on which his attention was concentrated that the relations subsisting between the various phenomena dawned upon him, and he saw them as if by some process of *instinctive vision* denied to others. It is the gift of a *seer*.[50]

For Thompson, there was no tension between speculation and the search for truth, so long as speculation was kept in check by evidence gained from experiment. Importantly, the search for truth was not a cold, logical procedure. Instead, Faraday was in a heightened emotional state when pursuing his experimental researches; thus Thompson reported that when demonstrating the action of magnetism on light, "Faraday rubbed his hands excitedly, while his eyes lit up with fire, and his animated countenance told the passionate feelings which he brought to the discovery of truth."[51] On this issue, as on others, Thompson drew attention to the immersive experience of successful scientists, who committed themselves intellectually, emotionally, and spiritually to the study of nature.

Thompson also devoted a section of his Swarthmore Lecture to "Intuition and Truth." Intuition, he noted, was involved in the discovery of religious truth; thus the "Inner Light" is the source of divine revelation. Intuition is also involved in other activities, including science. For Thompson, logic, induction, and deduction were insufficient; intuition is also required in science. "Many scientific discoveries … have been made by intuition; by a sort of inspired guessing which has led to verifiable results," he asserted.

> Truth seems suddenly to flash across the inquirer immersed in his research. He becomes aware of something of which a moment before he was not aware. … Great scientific discoverers are men who appear to have a genius for the intuitive perception of hitherto unknown facts.[52]

As Thompson noted, the French philosopher Henri Bergson had recently acknowledged the importance of intuition, which he had characterised as "knowledge at a distance."[53]

Likewise, in his posthumously-published *A Not Impossible Religion*, Thompson reflected on what he called "the faculty of vision or discernment" possessed by artists, poets, musicians, and scientists. He then cited the example of Faraday as possessing this intuitive faculty "in a remarkable degree."

> Familiarising himself with the experimental facts, living amongst them, … his thoughts play freely about them, he became able to foresee new facts and new relations, which subsequently were verified by experiment, some only with extreme difficulty, and others not in his own lifetime.[54]

Thompson's arguments about the importance of intuition in science intersect with a wider contemporary concern over the respective roles of reason and imagination in science. Positivism, which gained considerable popularity during the closing decades of the 19th century, asserted that authentic knowledge had to be firmly grounded in empirical evidence and required principally the exercise of reason, with the imagination attributed only a minimal role or none at all.[55] However, writers as diverse as John Tyndall and George Macdonald, who wrote fantasy stories, rejected this positivist account and argued that reason is insufficient for the practice of science. It has to be supplemented by imagination.[56] Science, they argued, is a creative activity requiring exercise of the imagination, just like art, music, and poetry. Thompson likewise rejected the positivist view of science; however, he attributed the human

[50]S. P. Thompson (1910, pp. 1125–1126); emphasis added.
[51]S. P. Thompson (1898, p. 240).
[52]S. P. Thompson (1915, p. 107).
[53]S. P. Thompson (1915, p. 107); Bergson (1911). See also S. P. Thompson (1918, p. 202).
[54]S. P. Thompson (1918, p. 65).
[55]For example, G. H. Lewes (1887, pp. 249–250) claimed that positivism "is characterised by that necessary and permanent subordination of the imagination to observation which specially constitutes the scientific spirit, in opposition to the theological or metaphysical spirit."
[56]Tyndall (1870); Macdonald (1893).

aptitude for insight to intuition, rather than to the imagination. Thompson insisted that intuition was essential to both religion and science: It enables us to perceive spiritual truths; similarly, the creative scientist uses this "supra-rational faculty" to recognise "previously unknown facts." In rejecting the positivist account of science, Thompson described the power of intuition as "neither inductive nor deductive in its form of operation; it is more akin to imagination than to logic, being creative and spontaneous, independent of the mental processes of analysis and synthesis which constitute the ordinary machinery of thought."[57] In writing his biographies of Faraday and Kelvin, Thompson sought to demonstrate to the reader that successful scientists creatively combine experiment, reason, and intuition.

5 | THE IMPORTANCE OF PERSONALITY

The *Book of Christian Discipline* specifies the moral values that Quakers should cultivate and the format of their engagement with other Friends and those outside the Quaker community. For example, sections are devoted to "Liberality and Benevolence, and Against Covetousness" and "Counsel to Employers," the latter specifying how a Quaker employer should treat servants and apprentices.[58] In his biographies of Faraday and Kelvin, Thompson likewise emphasised his subjects' moral virtues and empathetic relationships with others. For example, he ended his account of Faraday by praising his subject's "frank single-minded simplicity of soul," his "transparent honesty of soul," his "genuine Christian humility," and his "virtues of kindness, earnestness, and sympathetic devotion." Faraday was a "great and good man"—all personal qualities fostered by Quakers.[59]

Faraday's moral standing was also extolled in the sonnet by William Cosmo Monkhouse that prefaced Thompson's biography. To quote the first four lines:

> Was ever man so simple and so sage,
> So crowned and yet so careless of a prize!
> Great Faraday, who made the world so wise,
> And loved the labour better than the wage.[60]

Examples of Faraday's honourable actions were given throughout Thompson's biography, including his refusal to accept a pension from the Prime Minister, Lord Melbourne, after Melbourne had spoken scathingly of the practice of giving pensions to people who contributed to science and literature.[61]

Thompson likewise stressed Kelvin's good standing among those who knew him. For example, he reproduced a text in which one of Kelvin's students recounted the "very great "vivacity and enthusiasm of the Professor" and proceeded to communicate Kelvin's relaxed, friendly, and supportive attitude towards his students.[62] Thompson also included the text of a speech delivered in 1896 by James Bell, the Lord Provost of Glasgow, to mark Kelvin's 50 years' service as Professor of Natural Philosophy: "Lord Kelvin, indeed, inspires love and reverence in all. His home life is love and melody."[63] Thompson commented approvingly on Kelvin's "entire disinterestedness" in not mounting a personal attack against the surgeon and electrician Wildman Whitehouse, who had very aggressively criticised Kelvin's approach to implementing the Atlantic cable. Instead, he "pleaded that Mr. Whitehouse's name should still remain connected with the [Atlantic Telegraph] Company!" Thompson further stated that Kelvin "was ever modest as to his own part [in the cable project], optimistic, and generous" to others, including Whitehouse.[64]

[57] S. P. Thompson (1915, p. 107).
[58] *Book of Christian Discipline* (1883, pp. 125–130, 130–132).
[59] S. P. Thompson (1898, p. 299). Many of those who knew Faraday praised his kindness and generosity. See, for example, Tyndall (1868, pp. 150, 153).
[60] S. P. Thompson (1898, p. v). The sonnet "On a Portrait of Faraday" was first published in Monkhouse (1890, p. 99).
[61] S. P. Thompson (1898, p. 71).
[62] S. P. Thompson (1910, pp. 651–653).
[63] S. P. Thompson (1910, p. 983).
[64] S. P. Thompson (1910, pp. 372–373). See also S. P. Thompson (1910, p. 331); Hunt (1996); Smith & Wise (1989, pp. 661–677).

Thompson took pains to portray Kelvin as a gentleman and a thoroughly moral scientist. For example, he asserted that Kelvin "stood as far as possible aloof" in the heated priority dispute over the discovery of the mechanical equivalent of heat, in which Tyndall had advanced the claims of Julius Robert von Meyer, while Peter Guthrie Tait supported James Joule. Thompson informed the reader that "[i]n matters of priority in scientific discovery he [Kelvin] was always generous; and he has [also] shown remarkable generosity toward Clausius in coupling his name with that of Carnot as to the law of [energy] transformation."[65] Kelvin's moral virtues were also evident in his determined commitment to the highly demanding Atlantic cable project:

> The work he undertook for it was enormous; the sacrifices he made for it were great. The pecuniary reward was ridiculously small. The actual position which he held was relatively subordinate, and must have been at times galling. Yet he bore himself throughout with the most unswerving courtesy and delicacy of feeling.[66]

In Thompson's narrative, Kelvin emerges as a fair-minded scientist who is utterly committed to his work and to the public good.

As Thomas Dixon has shown, the term altruism—the human attribute of acting in a disinterested manner and for the benefit of others—was widely discussed by Victorians, who often contrasted altruism with egoism (generally taken to mean a person acting selfishly).[67] Quakers had long approved disinterested, socially beneficial actions and condemned egoistical ones. Although Thompson did not use the word altruism in his biographies, when discussing Faraday's relation to the scientific community he noted that Faraday "had no jealousy of cooperation in science," quoting a letter in which Faraday expressed a strongly altruistic attitude towards the practice of science: "It is wonderful how much good results from different persons working [together] at the same matter. Each one gives views and ideas new to the rest. When science is a republic, then it gains."[68]

In his other principal biography, Thompson drew attention to the argument Kelvin articulated in his 1871 presidential address before the British Association for the Advancement of Science, in which he had stated that the application of science "promote[s] the social and material welfare of man." In particular, Kelvin noted, those who helped fund "the original Atlantic Telegraph were impelled and supported by a sense of the grandeur of their enterprise, and of the world-wide benefits which must flow from its success."[69]

Quakers are exhorted to live humbly and uphold Christian values. Thus the *Book of Christian Discipline* recounted Paul's advice about money: "for the love of money is the root of all evil; which while some coveted after, they have erred from the faith, and pierced themselves through with many sorrows." To which was added the advice: "Beware, therefore, dearly beloved, lest you also, being led aside by the love of this world and the deceitfulness of riches, 'fall from your own steadfastness.'"[70] While many Quakers have been successful businessmen, industrialists, and even bankers, they are expected to act ethically and not become enamoured of money.[71] Thompson was therefore greatly impressed by Faraday's attitude to money and recounted that, although Faraday could have earned large sums by commercially analysing chemical substances, "[f]rom all such mundane 'success' he cut himself off when in 1831 he decided to abandon professional fee-earning, and to devote himself to the advancement of science." Likewise, he quoted an 1859 letter in which Faraday asserted that "money is no temptation to me. In fact, I have always loved science more than money."[72]

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[65]S. P. Thompson (1910, p. 291). Cf. Smith & Wise (1989, pp. 335–336).

[66]S. P. Thompson (1910, pp. 338–339). Thompson's claim that Kelvin's "pecuniary reward [from working on the Atlantic telegraph] was ridiculously small" was an understatement.

[67]Dixon (2008).

[68]S. P. Thompson (1898, p. 284); partly quoted in Tyndall (1868, p. 153). This letter to Tyndall was dated November 19, 1850: James (1991–2011, Vol. 4, p. 203). See also Cantor (1991, pp. 119–160).

[69]S. P. Thompson (1910, p. 601), quoting Thomson (1894, p. 161).

[70]*Book of Christian Discipline* (1883, p. 126). The quoted biblical passages are from 1 Timothy 6:10 and 2 Peter 3:17.

[71]See, for example, Raistrick (1968); Isichei (1970, pp. 171–185).

[72]S. P. Thompson (1898, pp. 244, 234).

By contrast with Faraday's aversion to accumulating money, Kelvin became wealthy though his work on the Atlantic Cable, which was funded extensively, and he profited financially from his inventions. Thompson thus noted that the income from Kelvin's partnership with Cromwell Varley and Fleeming Jenkin "was considerable, for they derived handsome profits from their inventions."[73] Yet Kelvin is also portrayed as putting his wealth to good, ethical use, such as making contributions to a fund to assist deserving natural philosophy students at Glasgow and donating £2,000 towards a new post of demonstrator in his department.[74] Thompson quoted an address at a prize-giving ceremony at Glasgow, where Kelvin told students that although they had "not been making money … you have been creating a property more precious than gold or silver" through their studies at the university.[75]

In his *Faraday*, Thompson portrayed Davy much more harshly than had the earlier Faraday biographers, and laid the blame for Davy's failings squarely on his personality. Davy, wrote Thompson, "was a man almost destitute of order and method. He had little self-control, and the fashionable dissipations which he permitted himself lessened that little."[76] (Faraday was, by contrast, praised for keeping his temper under control.) A few pages later Thompson quoted from T. E. Thorpe's biography of Davy, in which Thorpe claimed that his subject's "moral weakness [was] at the bottom of much of his unpopularity."[77] By contrast, Faraday was depicted as this "so perfect a character"; his only identifiable shortcomings were that he ignored the electrician William Sturgeon and failed to appreciate John Dalton's contributions to science.[78]

For Thompson, personality (including morality) governed all. A person's scientific endeavours were aspects of his or her personality. Only a strong, moral, truth-seeking person could become a virtuous scientist. The biographies of Faraday and Kelvin were written to demonstrate that the subject's personality underpinned his achievements in science. Moreover, the positive moral attitudes that he identified in his subjects—particularly in Faraday—were those advocated by the Society of Friends and, of course, by Thompson himself.

6 | RELIGIOUS DIFFERENCES

Although Thompson, Faraday, and Kelvin belonged to different Christian denominations, according to Thompson their religious outlooks had much in common. As noted above, he praised Faraday's "genuine Christian humility."[79] However, as impressive as he found Faraday's personal and spiritual virtues, Thompson could not countenance the way Faraday read the Bible. Sandemanians—the small Christian sect to which Faraday belonged—believed that every word in the biblical narrative is true, being of divine origin. They therefore read the Bible in a literal and rigid manner, avoiding as far as possible imposing on the text any misinterpretation of human origin. Hence the exhortations delivered at Sandemanian meeting houses consisted largely of biblical quotations.[80] This reliance on the biblical text was unacceptable to a Quaker like Thompson, who criticised Faraday for refusing to subject the text of the King James Bible to scrutiny and thus failing to appreciate that over its history it had accumulated errors of printing, transcription, and so on. The biblical narrative was not therefore the unadorned word of God.[81] Importantly, for a modernist Quaker like Thompson, the Bible was not the best or only source of revelation; instead, he principally valued the illumination of the "Inner Light" in each individual.[82]

[73]S. P. Thompson (1910, p. 650). His wealth at time of death was £128,925. See Smith (2004).
[74]S. P. Thompson (1910, p. 557).
[75]S. P. Thompson (1910, p. 1005).
[76]S. P. Thompson (1898, p. 42). The disapproving phrase "fashionable dissipations" refers to Davy's unQuakerly habit of courting the aristocracy. See Paris (1831, Vol. 2, p. 182).
[77]S. P. Thompson (1898, p. 59); Thorpe (1896, p. 220).
[78]S. P. Thompson (1898, p. 226).
[79]S. P. Thompson (1898, p. 299).
[80]Cantor (1985; 1991).
[81]S. P. Thompson (1898, p. 299).
[82]See Stanley (2021).

Turning to Kelvin, Thompson claimed that he had "never made any parade of his [religious] views." He "was a man of earnest convictions, quietly but tenaciously sustained, without bigotry or intolerance." According to Thompson, Kelvin had been brought up in the Church of Scotland and had later also attended services in the Church of England, the Free Church of Scotland, and the Scottish Episcopal Church. He was portrayed as unattached to any one denomination or creed. Thompson likewise cited an anonymous friend of Kelvin's who claimed that he was "sincerely religious … he looked deep into essentials … [and] looked on the distinctions between [the different sects] with supreme indifference." In a delightful footnote Thompson wrote:

> Of sacerdotalism and ritualism in all its phases and forms he [Kelvin] had an unconcealed detestation. He even went once so far as to write that the only sense in which he could regard the "High" Church as high, was the same as that in which game is said to be "high"—when it is decomposing.[83]

Like Faraday, Kelvin was portrayed as a sincere Christian, imbued with true Christian morality. Thompson's insistence that Kelvin was not committed to any one Christian denomination and his detestation of creeds emphasised the points of similarity between Thompson's Quakerism and Kelvin's religion. However, Thompson's overly ecumenical account failed to acknowledge that Kelvin grew up in a household strongly committed to the Church of Ireland or that later in life he served as an elder in the Church of Scotland.[84]

7 | THE ROLE AND VALUES OF "SCIENTIFIC MEN"

In 1895, Thompson delivered a lecture entitled "Can a Scientific Man Be a Sincere Friend?" at a Quaker conference in Manchester.[85] The term "scientific man" seems incongruous (as does the gender bias), as we would have expected him to use the word scientist, which had been coined by William Whewell in 1834 and was in wide circulation by the 1890s.[86] However, Thompson avoided using this word in this lecture, in his biographies, and in other writings (except when quoting source material) and instead generally deployed the term "scientific man" or "man of science." Following Faraday, he eschewed the word scientist as they both appear to have considered that it connoted the pursuit of science for gross financial gain and not for higher moral and religious ideals. (Faraday described himself as a chemist, an electrician, a natural philosopher, or an experimental philosopher.[87]) Kelvin likewise disliked the word scientist.[88] Instead, he identified as a natural philosopher, practised natural philosophy, and held the professorship of natural philosophy at the University of Glasgow.[89] By contrast, Thompson rarely used that term natural philosophy; instead, the words "science" and "scientific" appear very frequently in his writings.

The ethical prescriptions of Quakerism informed Thompson's notion of how a scientific man should behave in investigating the natural world. Like Faraday, Thompson considered that practitioners of science should investigate the natural world—God's creation—in a religiously grounded frame of mind. As he insisted in his Manchester lecture, if such an approach were adopted there would be no conflict between science and his own religion; hence a "scientific man" could indeed be "a sincere Friend."[90]

Thompson's commitments as a Quaker influenced not only his practice of science but also, as argued above, his narratives of the lives of scientific men. His short biographies of Reis and Sturgeon were intended to render justice by drawing attention to the achievements of two inventors whose work had been overshadowed by the claims of

[83]S. P. Thompson (1910, pp. 1086–1088).
[84]Holmes (2011).
[85]S. P. Thompson (1896).
[86]Ross (1962).
[87]Cantor (1991, pp. 139, 142).
[88]S. P. Thompson (1910, p. 1119).
[89]Smith & Wise (1989, pp. 83–116).
[90]S. P. Thompson (1896, p. 230).

their more famous and assertive contemporaries. Likewise, in writing his biographies of Faraday and Kelvin, Thompson viewed his subjects through a Quaker lens, emphasising their moral qualities. Despite evidence of occasional lapses, he considered Faraday's ethical beliefs and moral actions to be exemplary. Thus, over a wide range of issues he identified with Faraday and portrayed him as his ideal man of science, a reflection of his own scientific persona. Owing to Kelvin's greater participation in worldly affairs, he was less easily depicted as a moral exemplar. Nevertheless, Thompson succeeded in finding many Quakerly virtues in Kelvin, such as his humility, his altruism, his generosity towards others, and his rejection of religious dogma. Thompson also used his biographies of Faraday and Kelvin to demonstrate the importance of intuition in the successful practice of science, thereby eschewing the positivist account of scientific activity. In showing that both Faraday and Kelvin possessed deep insight into the natural world, Thompson evoked the central Quaker belief that each individual is endowed with a divine spark—the "Inner Light." Thus, in his biographies Thompson projected onto both Faraday and Kelvin not only Quaker values but also the Quaker understanding of the spiritual nature of humankind. Faraday and Kelvin were thereby endowed with Quakerly characteristics and ones that Thompson himself possessed and encouraged.

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